

### **AMENDMENTS TO THE CLAIMS:**

This listing of claims will replace all prior versions and listings of claims in the application:

1-26. (Cancelled).

27. (New) A method for the production of SO<sub>2</sub> from the combustion of elemental sulfur and pure oxygen, comprising the steps of:

feeding liquid sulfur into an atomizer in a burner;

atomizing the liquid sulfur in the burner together with return SO<sub>2</sub> and pure oxygen, and

producing oxidative combustion of the liquid sulfur and the pure oxygen in a combustion chamber to produce SO<sub>2</sub>, in the presence of the return SO<sub>2</sub>, wherein the return SO<sub>2</sub> is used as a cooling and diluting agent for the reactants taking part in the oxidative combustion in the combustion chamber, the temperature of the oxidative combustion of the liquid sulfur does not exceed 1250°C, and the production is controlled by maintaining a defined ration of S, O<sub>2</sub> and SO<sub>2</sub>.

28. (New) The method for the production of SO<sub>2</sub> according to claim 27, wherein the return SO<sub>2</sub> corresponds to at most 80% of the SO<sub>2</sub> produced in the oxidation of the sulfur.

29. (New) The method for the production of SO<sub>2</sub> according to claim 27, wherein oxygen not consumed during the oxidative combustion is measured and re-entered into the combustion chamber together with the return SO<sub>2</sub> in order to be reused.

30. (New) The method for the production of SO<sub>2</sub> according to claim 27, wherein an S : O<sub>2</sub> : SO<sub>2</sub> ratio, expressed in grams, entering into the combustion chamber in the range of from 32 : 32.63 : 243.42 to 32 : 333.6 : 262.64.

31. (New) The method for the production of SO<sub>2</sub> according to claim 30, wherein the S : O<sub>2</sub> : SO<sub>2</sub> ratio, expressed in grams, entering into the combustion chamber is about 32 : 32.63 : 256.23.

32. (New) The method for the production of SO<sub>2</sub> according to claim 29, wherein regulation of new oxygen entering as a reactant into the combustion chamber is carried out in an on line sensor that measures the oxygen returning to the combustion chamber, after steps of purifying and cooling of the SO<sub>2</sub> produced.

33. (New) The method for the production of SO<sub>2</sub> according to claim 32, wherein the regulation of the new oxygen added to the return oxygen before entering into the combustion chamber is carried out based on a proportional valve controlled by the return oxygen sensor.

34. (New) The method for the production of SO<sub>2</sub> according to claim 33, wherein the amount of oxygen entering into the combustion chamber is controlled to be at a 2% - 5% excess relating to the stoichiometric value of S and O<sub>2</sub>.

35. (New) The method for the production of SO<sub>2</sub> according to claim 27, wherein the required amount of sulfur is controlled based on a sulfur flow sensor.

36. (New) The method for the production of SO<sub>2</sub> according to claim 35, wherein according to the desired SO<sub>2</sub> production, the entrance of sulfur into the combustion chamber is pre-defined and regulated.

37. (New) The method for the production of SO<sub>2</sub> according to claim 36, wherein liquid sulfur enters into the combustion chamber at a temperature of between 130 and 135°C, which temperature is maintained by steam produced in a multistep heat exchanger post-combustion chamber.

38. (New) The method for the production of SO<sub>2</sub> according to claim 27, wherein the oxidative combustion is produced from liquid sulfur in a pulverized microdrop state produced in the atomizer of the burner.

39. (New) The method for the production of SO<sub>2</sub> according to claim 27, wherein the combustion chamber is maintained at a temperature higher than 1100°C and lower than 1250°C.

40. (New) The method for the production of SO<sub>2</sub> according to claim 39, wherein the combustion chamber is maintained at a temperature of about 1167.5°C.

41. (New) The method for the production of SO<sub>2</sub> according to claim 27, wherein the SO<sub>2</sub> produced contains SO<sub>3</sub> which is absorbed in counter current flow in a 98% H<sub>2</sub>SO<sub>4</sub> tower.

42. (New) The method for the production of SO<sub>2</sub> according to claim 27, wherein between 20% and 30% of the SO<sub>2</sub> produced and remaining unreacted oxygen are cooled in a cooling liquefaction unit, operating at a temperature of between -10 and -60°C, to liquefy the SO<sub>2</sub> into liquid SO<sub>2</sub>.

43. (New) The method for the production of SO<sub>2</sub> according to claim 27, wherein between 20% and 30% of the SO<sub>2</sub> produced and remaining unreacted oxygen are cooled in a compression cooling liquefaction unit, operating at a pressure of

between 3.8 and 5.0 bar, and a water cooler to maintain them under 32°C, to liquefy the SO<sub>2</sub> into liquid SO<sub>2</sub>.

44. (New) The method for the production of SO<sub>2</sub> according to claim 42, wherein the liquefaction of the SO<sub>2</sub> is favored by the absence of an uncontrolled excess of oxygen mass and a higher concentration of gaseous SO<sub>2</sub>.

45. (New) The method for the production of SO<sub>2</sub> according to claim 42, wherein up to 80% of the SO<sub>2</sub> as a total volume not passing through the liquefaction unit is sent back as the cooling and diluting agent to the burner of the combustion chamber.

46. (New) The method for the production of SO<sub>2</sub> according to claim 27, wherein the SO<sub>2</sub> produced has a purity above 99.90%.

47. (New) The method for the production of SO<sub>2</sub> according to claim 46, wherein the elemental sulfur content is under 2 ppm.

48. (New) The method for the production of SO<sub>2</sub> according to claim 47, wherein the greatest impurity in the final SO<sub>2</sub> produced in a liquefied state corresponds to the polycyclic aromatic hydrocarbons contained in the original sulfur and do not exceed 0.05% by weight.

49. (New) The method for the production of SO<sub>2</sub> according to claim 48, wherein the aromatic hydrocarbons of the impurities are sulfonated after the sulfur oxidation.